Original Research Article

IEC (Information Education Communication) module as an effective tool for mitigation of iron deficiency anaemia among rural adolescent girls of Uttarakhand, India

ABSTRACT:

Aim: Present study was planned to assess the effectiveness of an IEC module for reducing the incidence of anaemia among rural adolescent girls by bringing about a change in their knowledge attitude and practices related to the prevalence of anaemia.

Study Design: Concurrent parallel study design

Place and duration of the study: Department of Foods and Nutrition, College of Home Science, G. B. Pant University of Agriculture and Technology, Pantnagar, between November, 2015 to October, 2016.

Methodology: A total 288 rural adolescent girls of government schools in the age between 13-16 years were selected for the study. Subjects were divided randomly in 2 groups i.e. experimental group (exposed to IEC) and control group (not exposed to IEC), each having144 girls. Haemoglobin levels and knowledge, attitude and practices (KAP) scores were recorded using haemoglobin meter and questionnaire respectively, before and after IEC programme in both the groups. Paired-t test was applied to compare changes in haemoglobin level and Knowledge, attitude and practices scores of the adolescent girls.

Results: IEC programme improved the knowledge, attitudes and practices and haemoglobin levels of the subjects in experimental group, with percent increase of 18.93 percent in knowledge, 6.79 percent increase in attitude and 4.51 percent increase in practice score. Favourable effect of IEC programme on haemoglobin levels of the experimental group was evident as proportion of the subjects having normal haemoglobin levels was increased significantly from 0 to 27.08 percent, moderate anaemia was decreased from 30.55 percent to 11.11 percent post IEC programme. While in control group non significant changes were observed.

Key words: Information, Education, Communication, haemoglobin, Adolescents, Anaemia

1. INTRODUCTION:

Adolescence is marked by a rapid phase of growth and development during which the requirement of nutrition and micronutrients is relatively high. Therefore, adolescents, especially girls, are vulnerable to iron deficiency. Anaemia affects half a billion women of reproductive age worldwide. Anaemia impairs the health and well-being in women and increases the risk of maternal and neonatal adverse outcomes. In 2011, 29% (496 million) of non-pregnant women and 38% (32.4 million) of pregnant women aged 15-49 years were anaemic (1). Studies indicate that the incidence of anaemia in adolescents tends to increase with age and corresponds with the highest acceleration of growth during adolescence. The highest prevalence is between the ages of 12-15 years when requirements are at peak. More than 50% girls in this age group have been reported to be anaemic. (2, 3, 4, 5). According to National Family Health survey-4 (2015-2016) (6) in Uttarakhand state of India 46.1 and 43.4 percent of rural and urban non-pregnant women respectively of age 15-49 years are anaemic (<12.0 g/dl).

Iron requirements increase dramatically during adolescence as a result of the expansion of the lean body mass, total blood volume and the onset of menstruation. These changes make adolescent girls more susceptible to anaemia, which has lasting negative impact for them and for the survival, growth, development of their children later in life. Anaemia during adolescence affects the growth and development of girls, diminishes their concentration in daily tasks, limits their learning ability, increases their vulnerability to dropping out of school, causes loss of appetite resulting in reduced food intake and irregular menstrual cycles, and reduces physical fitness and future work productivity. Moreover, anaemia during adolescence influences women's entire life cycle since anaemic girls will have lower pre pregnancy iron stores. As pregnancy is too short a period to build the iron stores required to meet the needs of the growing foetus, women who enter pregnancy anaemic are at an increased risk of giving birth to children with a low birth weight (below 2,500 grams), delivering pre-term newborns, and/or dying while giving birth. Additionally, children born to anaemic women are more likely to die before the age of one year and be sick, undernourished and anaemic, thus perpetuating the intergenerational cycle of maternal and child under nutrition. Hence, investing in preventing anaemia during adolescence is critical for adolescent girls themselves as well as for the survival, growth and development of their children later in life (7).

Globally, one in three non-pregnant women, corresponding to almost 500 million,were anaemic in 2011(8). Iron deficiency is thought to contribute to at least half of the global burden of anaemia. Iron deficiency occurs following prolonged negative iron balance, the major causes of which include inadequate intake owing to insufficient bio-available iron in the diet or decreased iron absorption, increased iron requirements (for instance, during periods of growth) and chronic blood loss (from heavy hookworm infection or menstrual bleeding (9). In adolescent girls, menstrual blood losses, accompanied by rapid growth with expansion of the red cell mass and increased tissue iron requirements, make them particularly vulnerable to iron deficiency compared to male counterparts (10).

The informative & educable intervention definitely has a positive effect on awareness levels which would eventually encourage expansion of knowledge & positive health habits (11)

Information, Education and Communication (IEC) combines strategies, approaches and methods that enable individuals, families, groups, organizations and communities to play active roles in achieving, protecting and sustaining their own health.

In other words IEC is the process of learning that empowers people to make decisions, modify behaviours and change social conditions. Activities are developed based upon needs assessments, sound educational principles, and periodic evaluation using a clear set of goals and objectives (12**).** Further, Timely and quality communication with adolescent girls, their families and communities about the consequences of anaemia, the benefits of the anaemia control programme, and the potential undesirable side-effects of supplementation and deworming and how to mitigate them is essential to ensure girls' adherence to the programme. Communication strategies focusing on the benefits of the programme for adolescents' health and school performance seemed to be the most effective (13).

The present study therefore is an endeavour to assess the effectiveness of an intervention programme for reducing the incidence of anaemia among adolescent girls. The intervention is an IEC module (Information Education Communication) that has been tested among adolescent school girls in the state of Uttarakhand. The IEC programme was carried out in the study area between November, 2015 to October, 2016. The study was planned with the following objectives:

(i) To improve the knowledge of adolescent school girls in the area of basic nutrition, anaemia, health and hygiene.

(ii) To sensitise the respondents about anaemia as a serious health issue, its symptoms, identification, impact and control.

(iii) To motivate the adolescent school girls to adopt good practices with reference to correct food habits, cooking techniques and personal and family hygiene as a means for combating the problem of anaemia.

(iv) To evaluate the effect of IEC programme on haemoglobin and Knowledge, attitude and practices of the subjects.

2. MATERIALS AND METHODS:

2.1 Locale:

The present study was conducted in Uttarakhand state of India that has a total of 13 districts.Uttarakhand is one of the special states of the country having total area of 53,483 sq km. Currently population density of Uttarakhand is 189 per Sq.km. Uttarakhand is located on the foothills of the Himalayan mountain ranges. The state has diverse geographical features ranging from snow-capped mountain peaks in the North to tropical forests in the South; its climate and vegetation vary accordingly. About 93 percent of the area is hilly, and the remaining 7 percent is covered by plains. Women are considered as the backbone of hill economy in Uttarakhand. In rural areas, women are contributing up to 90 percent of the total work in agriculture and animal care. The participation rate of women in the economy of the state is much higher than several other states.Two districts viz. Udham Singh Nagar and Nainital were taken up for the study.The experimental group was taken from Government High Schools of Nagla and Shantipuri of UdhamSingh Nagar district while the control group was taken from Government High School Halduchaur of Nainital district. The selected districts come under Tarai region of the Uttarakhand state.

2.2 Ethical consent:

Prior to the initiation of the study ethical clearance was obtained from the University Ethical Committee of Govind Ballabh Pant University of Agriculture and Technology. Further informed consent was taken from each subject's parents prior to initiation of the study.

2.3 Sample Characteristics:

In Uttarakhand women constitute 48.99 percent of the total population. In the state, 91 percent of adolescent girls are affected by any form of anaemia. Twenty three percent of them are mildly anaemic, 39 percent are

moderately anaemic and 29 percent are having severe anaemia. For the present study rural adolescent girls of government schools in the age between 13-16 years were selected for the study. Actual age of the students was recorded from school registers.

2.3.1 Screening of subjects:

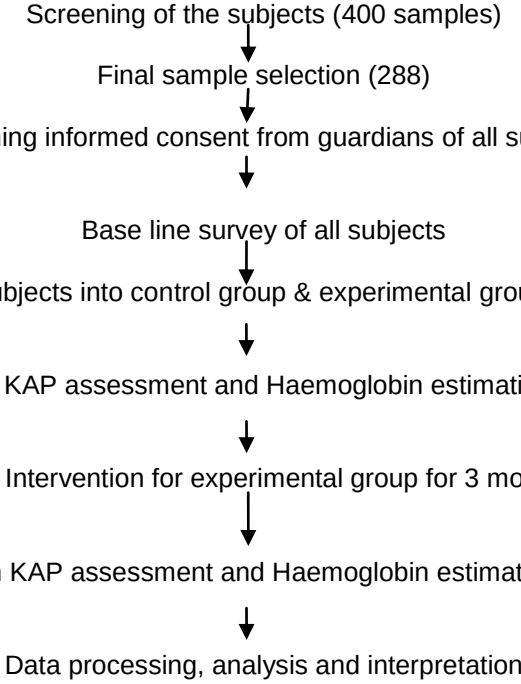
The inclusion criteria for screening of the subjects for the present study were as follows:

The subjects had to be rural adolescent girls in the age group between 13-16 years, having haemoglobin level up to 11.9 g /decilitre. Non anaemic subjects in the age group below 13 and above 16 years were excluded from the study.

400 adolescent girls were screened for the study to obtain the required sample size of 300. How ever there was a drop out of 12 subjects due to which the final sample size came to 288 respondents. Subjects were divided randomly in 2 groups i.e. experimental group and control group, each having144 girls.

2.4 Reseach Design: Concurrent parallel study design

The Flow chart of the research design:



Subjects of experimental group were given IEC intervention for a period of 3 months while those of control group were not given any IEC intervention. Haemoglobin levels and knowledge, attitude and

practices (KAP) scores were recorded (using questionnaire) before IEC programme in both the groups. Post IEC programme, haemoglobin and KAP scores were again recorded in both the groups.

2.5 Tools developed and equipments used:

Baseline Survey Questionnaire: A comprehensive pre tested questionnaire was utilized to collect information regarding the socio economic status, family details, food habits, morbidity pattern and menstrual information of each of the 288 respondents.

KAP Questionnaire: A pretested closed ended questionnaire having 30 questions with yes/no type and multiple choice answers was used to assess the knowledge, attitudes and practices (KAP) regarding anaemia among the 288 subjects, both before and after the IEC intervention.

Equipments used: A portable haemoglobin meter (model no. L7113P) from M/S Labtronics and Mission Hb haemoglobin test strips for estimation of haemoglobin of blood samples were used for estimation of blood haemoglobin of the samples both before and after the IEC intervention.

2.6 IEC Intervention: 144 subjects of experimental group were given 12 IEC messages in the form of Discussions, lectures, trainings, demonstrations, video films and slide shows. In control group no IEC programme was conducted. The following 12 topics were covered under the IEC programme.

1. Healthy body/Healthy human being: components constituting health; Body-Height/weight/body composition; Standards for specific age

2. Food groups and its function

3. Nutrients in food and their role and requirement for adults

4. Food groups and balanced food pyramid

5. Nutrient deficiency symptoms

6. Anaemia and its relation to food and nutrients

7. Anaemia causes, symptoms and preventive measures

8. Prophylactic programme to combat anaemia

9. Dietary supplement/cooking methods/fortification through daily diet food

10. Hygiene and sanitation

11. Preservation of nutrients

12. Government programmes on nutrition

2.7 Statistical analysis: Simple statistical tools like mean and standard deviation were used to process data for statistical analysis. Paired-t test was applied using MS Excel to compare the pre and post intervention haemoglobin level and Knowledge, attitude and practices scores (regarding anaemia) of adolescent girls in order to assess the effectiveness of planned IEC intervention.

3. RESULTS AND DISCUSSION:

3.1 Results:

3.1.1Effect of IEC programme on knowledge, attitude and practices related to anaemia among adolescent girls:

The IEC intervention focussed on the association between knowledge, attitude and practices of the respondents. Knowledge can be defined as the fact or condition of being aware or familiar with a subject. Attitude is mental position with regard to a fact or state. On the other hand practice is the usual way of doing something. For adolescent girls nutritional education should be provided through schools, other organizations, marketplaces or workplaces. Health promotion should be based on research that has identified cultural and institutional constraints and detrimental attitudes and practices (14).

3.1.1.1 Knowledge:

In experimental group, mean score of knowledge regarding anaemia in pre and post IEC programme was found to be7.08 and 8.42, respectively. A percent increase of 18.93 percent was observed after the IEC intervention programme in experimental group which indicated a positive effect of IEC programme. Whereas in control group, a percent decrease of 3.71 percent was observed with decrease in mean scores of knowledge from 7.55 to 7.27 after the study (Table1).

3.1.1.2 Attitude:

Regarding attitudes of the subjects, in experimental group, the mean score for attitudes was increased from 5.74 to 6.13 with percent increase of 6.79 percent, post IEC programme.

On the other hand, in control group, mean score for attitude decreased from 6.48 to 6.16 with percent decrease of 4.93 percent after the study (Table1).

3.1.1.3 Practice:

In experimental group mean score for practices increased from 8.65 (Pre IEC programme) to 9.04 (Post IEC programme) with percent increase of 4.51 percent. Whereas in control group, a decrease in mean score from 8.45 to 8.30 was observed with percent decrease of 1.78 percent (Table1).

Table. 1 Mean KAP scores of the subjects

Groups	Mean KAP Scores											p value
	Knowledge				Attitude				Practice			
	Pre score	Post score	% change	p value	Pre score	Post score	% change	p value	Pre score	Post score	% change	
Experimental group (n=144)	7.08 ±1.54	8.42 ±1.64	18.93 (+)	1.76118E-13^{NS}	5.74 ±1.67	6.13 ±1.65	6.79(+)	0.013411^{NS}	8.65 ±1.38	9.04 ±1.29	4.51(+)	0.004^{NS}
Control group (n=144)	7.55 ±1.65	7.27 ±1.87	3.71 (-)	0.02674467^{NS}	6.48 ±1.60	6.16 ±1.76	4.93 (-)	0.016686^{NS}	8.45 ±1.58	8.30 ±2.15	1.78 (-)	0.17^{NS}

+ means increase, - means decrease, NS-Non significant

3.1.2 Effect of IEC intervention on haemoglobin levels of the subjects:

Mean haemoglobin level of experimental group was found to be 10.39±1.18 g/dl and 11.33±1.11g/dl in pre and post IEC programme, respectively, whereas in control group haemoglobin content was decreased from 10.39±1.12 to 10.36±1.75 g/dl after study. Percent increase of 9.05 percent in Hb level of experimental group was observed and it was found statistically significant whereas in control a slight decrease of 0.29 percent was observed in haemoglobin level after the study that was found non significant. It shows the positive effect of IEC programme on experimental group (Table 2).

Table .2 Haemoglobin levels (Mean±SD) of subjects

Groups	Pre Hb(g/dl)	Post Hb (g/dl)	% change	P value
Experimental group (n=144)	10.39±1.18	11.33±1.11	9.05(+)*	0.63^{S}
Control group (n=144)	10.39±1.12	10.36±1.75	0.29(-)^{NS}	.02^{NS}

+ means increase, - means decrease, * means significant at P=0.05, NS means non significant

3.1.2.1 Categorization of the subjects as per the classification of anaemia (WHO):

Subjects of both experimental and control group were categorized as per the classification of anaemia by World Health Organization.

In pre IEC period 68.06 percent subjects of experimental group were affected by mild anaemia (Hb: 10-11.9g/dl), Further 30.55 percent subjects were found to be moderate anaemic (Hb:7-9.9g/dl), whereas 0.69 percent subjects of experimental group were severely anaemic (Hb:<7g/dl)

In post IEC period, haemoglobin level of the experimental group improved, as 27.08 percent subjects attained normal haemoglobin level (Hb: ≥12g/dl) and the percentage of the subjects having mild anaemia also decreased to 61.8 percent against 68.06 percent in pre IEC programme. Similarly the percentage of the subjects having moderate and severe anaemia came down to 11.11 and 0 percent respectively, post IEC programme (table 3).

In control group, proportion of the subjects falling in normal haemoglobin category increased from 0 to 18.75 percent, whereas proportion of the subjects having mild anaemia decreased from 65.97 percent to 47.22 percent. Further, percentage of the subjects having moderate anaemia increased from 33.33 to 34.03 percent after the study (table3).

Table.3 Categorization of subjects as per the classification of anaemia

Classification of anaemia	Hb level(g/dl)	Experimental group (n=144)				Control group (n=144)			
		Pre	Percent	Post	Percent	Pre	Percent	Post	Percent
Normal	≥12	-	-	39	27.08	-	-	27	18.75
Mild	10-11.9	98	68.06	89	61.8	95	65.97	68	47.22
Moderate	7-9.9	45	30.55	16	11.11	48	33.33	49	34.03
Severe	<7	1	0.69	-	-	-	-	-	-

3.2 DISCUSSION:

Anemia is a major public health problem prevalent among almost all age groups. An adolescent girl is 10 times more likely to develop anemia than a boy. Teenagers are at the highest risk of anemia during their adolescent growth spurt. Among girls, however, menstruation increases the risk for iron deficiency anemia throughout their adolescent and childbearing years.[20]

To combat the problem, strategies that have been adopted globally include supplementation and fortification. Both these strategies have been successful at various levels but there has been a little progress in anemia control due to various reasons. Thus, there is a need for a strategy that can be sustainable and effective. It is with this understanding that the present study was formulated in order to control the prevalence of anaemia in the state of Uttarakhand. In the present study effectiveness of the IEC intervention programme for mitigation of anaemia among rural adolescent girls was evaluated. In the experimental group, IEC programme helped to improve the knowledge, attitudes and practices of the subjects. It was reflected by increase of 18.93 percent in knowledge score, 6.79 percent increase in attitude score and 4.51 percent increase in practice score of the subjects. However, the change in KAP scores in both the groups was found statistically non significant. Use of educational aids through intervention has a positive effect on the nutritional knowledge of girls which may ultimately improve their nutritional status (15). The results of the present study are corroborated by the following investigations. IEC programme is beneficial for improving awareness regarding health and nutrition in women subjects (16). Nutrition education intervention has an impact on improving knowledge, attitude and practices of iron-deficient female adolescents compared with control (17).

A significant positive effect of IEC intervention was observed on the haemoglobin levels of the respondents which can be attributed to improved KAP after intervention in experimental group, whereas in control group non significant changes were observed. Similar results have been reported in the following studies. IEC training showed a positive effect on hemoglobin level of adolescent girls (18). Further, IEC intervention reflected the positive effects in terms of reducing the severity of anaemia as higher proportion of the subjects obtained the normal haemoglobin levels. Under a national programme, use of supplementation and IEC training to women and children resulted in increased haemoglobin levels in general by 15-20g/dl in a year and the prevalence of severe anaemia decreased in Uzbekistan (19).

4. CONCLUSION:

From the results of the study it may be concluded that IEC programme had a favourable effect on haemoglobin levels of the experimental group as the proportion of subjects having normal haemoglobin levels was increased significantly from 0 to 27.08 percent and percentage of subjects having moderate anaemia was decreased from 30.55percent to 11.11 percent post IEC programme. While in control group (where no IEC programme was conducted) non significant changes were observed. India has been a struggling to control the problem of anaemia for the past many years

through concentrating national level programmes such as the Anaemia Prophylaxis Programme; however not much success has been achieved in this direction. The present study goes to show that targeting the knowledge, attitude and practices of anaemic respondents helps in anaemia control to some extent. This information is of relevance for policy planners at the national and international level who are working to eradicate anaemia.

COMPETING INTERESTS:

Authors declare that there are no competing interests exist.

CONSENT:

All authors declare that 'written informed consent was obtained from the patient (or other approved parties) for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal.

ETHICAL APPROVAL:

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

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